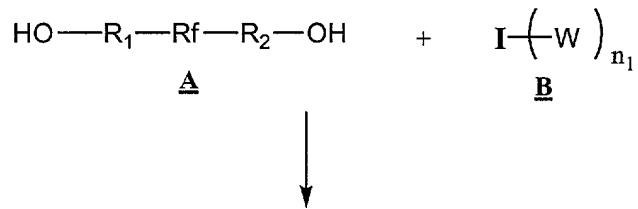


Claims

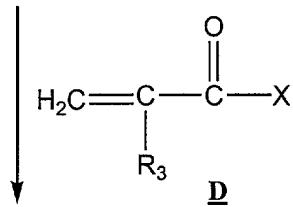
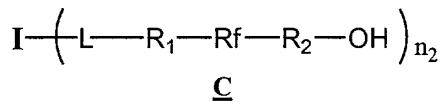
1. A photosensitive composition comprising:
 - a) at least one fluorinated, non-urethane containing multifunctional acrylate prepared at least one multifunctional alcohol, said alcohol being synthesized from a core molecule at least two equivalents of hydroxy-reacting functional groups and a fluorinated molecule at least two hydroxyl groups; and
 - b) at least one photoinitiator.

2. The photosensitive composition of Claim 1, wherein the non-urethane containing

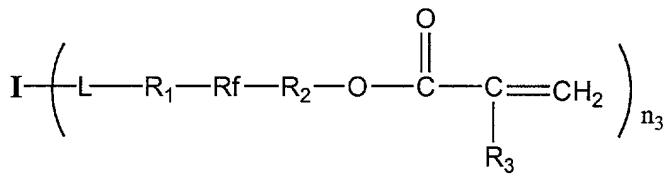
multifunctional acrylate is prepared using the following reaction scheme:



An alcohol product mixture containing



An acrylate product mixture containing



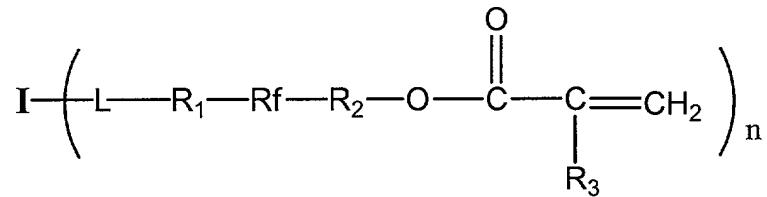
4 wherein **A** is a fluorinated monomer or polymer having two hydroxyl groups, wherein Rf is a
 5 monomeric or polymeric perfluorinated alkylene diyl, alkylene oxide, arylenediyI, arylene oxide,
 6 and mixtures thereof, and R₁ and R₂ are monomeric or polymeric divalent moieties such as
 7 alkylene diyl, alkylene oxide, alkylene sulfide, arylenediyI, arylene oxide, arylene sulfide,
 8 siloxane and mixtures thereof; **B** is a multifunctional molecule wherein **I** is a multivalent radical,
 9 W stands for one equivalent of hydroxy-reacting functional group and n₁ is at least 2; **C** is the
 10 multifunctional alcohol product mixture from **A** and **B**, wherein L is an ether or ester link and n₂
 11 is atleast 2; **D** is an acryloylation agent, wherein X is selected from OH, Cl and alkoxy; and **E** is
 12 the acrylate product mixture from **C** and **D**, wherein R₃ is H or CH₃ and n₃ is at least 2.

1 3. The photosensitive composition of Claim 2 wherein n_i (i=1-3) independently ranges
 2 from 3 to 6.

1 4. The photosensitive composition of Claim 2 wherein there are at least 2.5 equivalents
 2 of OH groups from **A** for every equivalent of hydroxy-reacting group, W, from **B**.

1 5. The photosensitive composition of Claim 2 wherein L is an ester link.

1 6. The photosensitive composition of Claim 2, wherein the acrylate **E** has the formula of:



3 wherein n ranges from 3 to 6.

1 7. The photosensitive composition of Claim 2 wherein Rf is a perfluorinated
 2 poly(methylene) moiety having at least 4 carbon atoms.

1 8. The photosensitive composition of Claim 2 wherein Rf is a perfluorinated
2 poly(alkylene oxide) moiety having at least 4 carbon atoms.

1 9. The photosensitive composition of Claim 2 wherein **B** is selected from a group
2 consisting of multifunctional carboxylic acid, acid chloride, ester and anhydride.

1 10. The photosensitive composition of Claim 2 wherein **B** is selected from 1,3,5-
2 benzenetricarbonyl trichloride, trimethyl-1,3,5-benzenetricarboxylate and 1,2,4-
3 benzenetricarboxylic acid.

1 11. The photosensitive composition of Claim 2 wherein **B** is selected from 1,2,3,4-
2 butanetetracarboxylic acid and tetraethyltrimethyl-1,1,2,2-ethanetetracarboxylate.

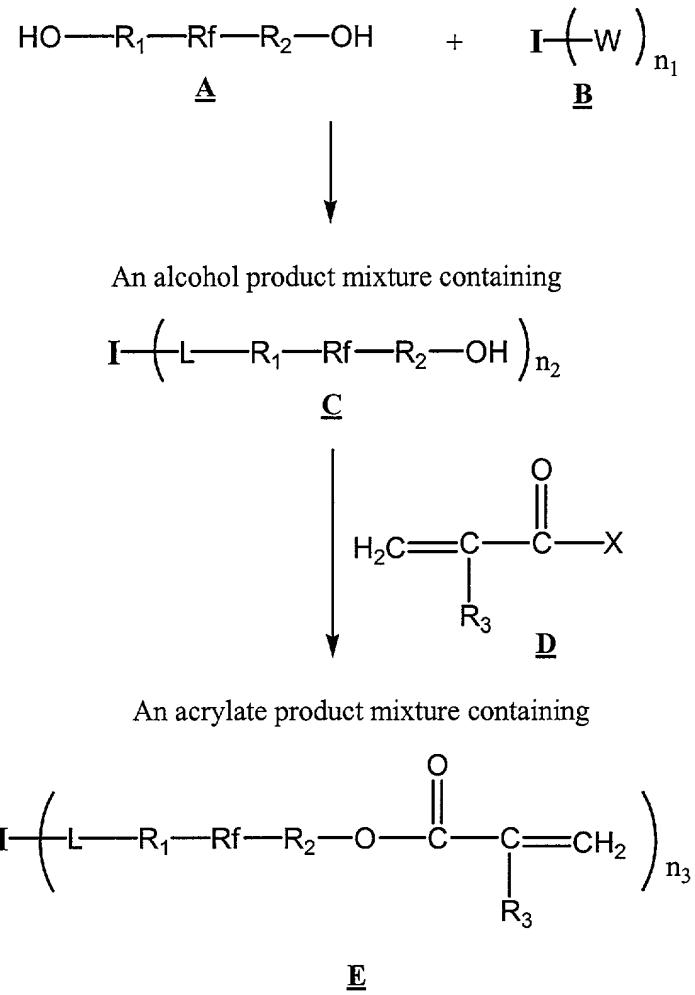
1 12. The photosensitive composition of Claim 1 wherein the acrylate has a number
2 average molecular weight of at least 500.

1 13. The photosensitive composition of Claim 1 wherein the photoinitiator composition is a
2 mixture of at least two different photoinitiators.

1 14. A waveguide device having a light-transmitting structure formed on a substrate by
2 patterning the photosensitive composition comprising:

3 a) at least one fluorinated, non-urethane containing multifunctional acrylate prepared
4 from at least one multifunctional alcohol, said alcohol being synthesized from a core molecule
5 having at least two equivalents of hydroxy-reacting functional groups and a fluorinated molecule
6 having at least two hydroxyl groups; and
7 b) at least one photoinitiator.

1 15. The waveguide device of Claim 14 wherein the multifunctional acrylate is
 2 prepared using the following reaction scheme:



3 wherein **A** is a fluorinated monomer or polymer having two hydroxyl groups, wherein Rf
 4 is a monomeric or polymeric perfluorinated alkylene diyl, alkylene oxide, arylene diyl, arylene
 5 oxide, and mixtures thereof, and R₁ and R₂ are monomeric or polymeric divalent moieties such
 6 as alkylene diyl, alkylene oxide, alkylene sulfide, arylene diyl, arylene oxide, arylene sulfide,
 7 siloxane and mixtures thereof; **B** is a multifunctional molecule wherein I is a multivalent radical,
 8 W stands for one equivalent of hydroxy-reacting functional group and n₁ is at least 2; **C** is the
 9 multifunctional alcohol product mixture from **A** and **B**, wherein L is an ether or ester link and n₂
 10

11 is atleast 2; **D** is an acryloylation agent, wherein X is selected from OH, Cl and alkoxy; and **E** is
12 the acrylate product mixture from **C** and **D**, wherein R₃ is H or CH₃ and n₃ is at least 2.

1 16. The waveguide device of Claim 14, wherein the waveguide structure is patterned
2 with an actinic radiation.

1 17. The waveguide device of Claim 14, wherein the waveguide structure is patterned with
2 reactive ion etching (RIE).

3 18. A thermo-optic device comprising a waveguide structure of Claim 14 and at least one
4 resistive heater.

5 19. The waveguide device of Claim 14 wherein said waveguide structure containing at least
6 one optical grating element.

7 20. The waveguide device of Claim 19 wherein said device comprising at least one resistive
8 heater.

1 21. A method to produce a waveguide device having a light-transmitting structure
2 formed on a substrate by forming a coating of a photosensitive composition on a substrate and
3 patterning the coating with an actinic radiation, said composition comprising:

4 a) at least one fluorinated, non-urethane containing multifunctional acrylate prepared
5 from at least one multifunctional alcohol, said alcohol being synthesized from a core molecule
6 having at least two equivalents of hydroxy-reacting functional groups and a fluorinated molecule
7 having at least two hydroxyl groups; and
8 b) at least one photoinitiator.

1 22. A method to produce a waveguide device having a light-transmitting structure
2 formed on a substrate comprising:

3 a) coating a layer of a first composition of at least one fluorinated, non-urethane
4 containing multifunctional acrylate prepared from at least one multifunctional alcohol, said
5 alcohol being synthesized from a core molecule having at least two equivalents of hydroxy-
6 reacting functional groups and a fluorinated molecule having at least two hydroxyl groups; and at
7 least one photoinitiator on a substrate and exposing the layer to an actinic radiation to form a
8 bottom cladding layer with a first refractive index, n_1 ;

9 b) coating a thin layer of a second composition of at least one fluorinated, non-urethane
10 containing multifunctional acrylate prepared from at least one multifunctional alcohol, said
11 alcohol being synthesized from a core molecule having at least two equivalents of hydroxy-
12 reacting functional groups and a fluorinated molecule having at least two hydroxyl groups; and at
13 least one photoinitiator on top of the bottom cladding layer and patternwise exposing the thin
14 layer to an actinic radiation through a photomask with a desired feature to form a latent image in
15 a core layer;

16 c) removing the non-exposed portions in the core layer with an organic solvent to form a
17 waveguide rib with a second refractive index, n_2 , wherein n_2 is greater than n_1 ; and

18 d) coating a thin layer of a third composition of at least one fluorinated, non-urethane
19 containing multifunctional acrylate prepared from at least one multifunctional alcohol, said
20 alcohol being synthesized from a core molecule having at least two equivalents of hydroxy-
21 reacting functional groups and a fluorinated molecule having at least two hydroxyl groups; at
22 least one photoinitiator on top of the core layer and the bottom cladding layer and exposing the

23 layer of the third composition to an actinic radiation to form a top cladding layer with a third
24 refractive index, n_3 , wherein n_3 is less than n_2 .

1 23. A waveguide device fabricated using the method of Claim 22.

1 24. The waveguide device of Claim 23, wherein $n_1 = n_3$.

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